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# Bargaining over time in ultimatum game experiments

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## Abstract

We report the first ultimatum game experiment with bargaining over waiting time. The experiment was created to avoid effects of windfall gains. In contrast to donated money, time is not endowed by the experimenter and implies a natural loss to the subjects. This allows for a better measurement of the inherent conflict in the ultimatum game. We implemented three anonymity conditions; one baseline condition, one condition with anonymity among the subjects and one double-blind condition in which the experimenter did not know the division of waiting time. While we expected to observe less other-regarding behavior in ultimatum game bargaining over time, our experimental results rather confirm previous ultimatum game experiments, in which people bargained over money. The modal offer was half of the waiting time and only one offer was rejected. Interestingly, anonymity did not change the results significantly. In conclusion, our experiment confirms other-regarding behavior in the ultimatum game.

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## 1 Introduction

Most laboratory experiments measuring social preferences study the division of “a cake that nobody had to bake” (Güth and Kliemt, 2003)[p. 320]. Subjects enter the laboratory, receive monetary presents and have to allocate these “windfall gains” (Arkes et al, 1994) among each other. It may not be so surprising that individuals behave not entirely egoistic and greedy in dividing these gifts. Nevertheless, the experimental results of how gifts are divided in dictator, ultimatum and other kinds of games have been the basis of theoretical models of other-regarding preferences (cf. Rabin, 1993; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), moving away from neoclassical approaches in favor of behavioral game theory (Camerer, 2003). While the experiments have been replicated in many different cultures (Henrich et al, 2004; Herrmann et al, 2008) and even neurologically grounded (Kenning and Plassmann, 2005), criticisms remain (cf. Levitt and List, 2007).

A problem of many experimental setups is the endowment of subjects with money: In this kind of “manna economy” (Güth and Kliemt, 2003) of bargaining over presents, other-regarding behavior is relatively costless (Kirchgässner, 1992; Diekmann and Preisendörfer, 2003). From prospect theory (Kahneman and Tversky, 1979) it is known that people are risk-seeking when trying to avoid losses but risk-averse when deciding over gains. Therefore, gains may evoke more cooperative behavior than losses (Raub and Snijders, 1997; van Assen, 2001; Poppe and Valkenberg, 2003; Ackert et al, 2006; Bardsley, 2008). A second problem is that this bias towards cooperation may even be amplified in experiments. As the subject is invited to a scientific laboratory, she knows that she is being paid attention to (Orne, 1962) and may feel obliged to act according to whatever she perceives as socially desirable behavior (cf. Roethlisberger and Dickson, 1939; Milgram, 1963; Burger, 2009). Since the experimenter provides presents to the subjects and asks them for a division of these presents between themselves and third parties, the subjects can easily conclude that the experimenter is interested in observing fair behavior.

This problem of social desirability can be addressed and studied with a variation of the level of anonymity in the experimental setup. Although subjects typically sit in isolated

cubicles and make their decisions without being observed by other subjects, they have to collect their money at the end of the experiment from a cashier. In this situation, the experimenter or an administrator hands over the payments. These payments are typically higher in ultimatum or dictator games if the subject behaved egoistically. Thus, the subject may anticipate to feel embarrassed to disclose that she has kept the monetary present of the experimenter rather than having distributed it equally among herself and the other experimental subject. This argument of “third party reciprocity” may be substantiated by evidence from “sequential” dictator games, in which subjects reciprocate previous offers from dictators in a second round (Diekmann, 2003) and further from third party punishment experiments (Fehr and Fischbacher, 2004). Moreover, previous experiments could demonstrate that selfish behavior increases with higher anonymity (cf. Cherry et al, 2002).

Therefore, our experimental design avoids the above described concerns. While it is hard to implement real monetary losses in laboratory experiments, *lost time* is a natural and “painful” loss for most people. We implemented bargaining over losses by asking subjects to divide a common waiting time of sixty minutes. Further, anonymity is varied in three different treatments: One baseline treatment, one with increased and one with high anonymity. We test the following hypotheses, which are substantiated below.

**Hypothesis 1** *Proposers impose almost the full waiting time on the responder.*

**Hypothesis 2** *Responders accept almost all offers except for having to wait for the full waiting time.*

**Hypothesis 3** *The higher the anonymity, the more waiting time imposes the proposer on the responder.*

**Hypothesis 4** *The costlier the waiting time in terms of opportunity costs, the more waiting time imposes the proposer on the responder.*

The prediction based on the subgame perfect Nash equilibrium is that the proposer should offer to wait for one minute and the responder accepts any time period up to fifty-nine minutes. We conjecture that in our setting, in which subjects bargain over real losses, offers are more selfish and closer to the Nash prediction than in common setups

of the ultimatum game (hypothesis 1). Furthermore, we conjecture that the responders' behavior is close to the Nash equilibrium of accepting any offer of less than sixty minutes (hypothesis 2). Moreover, we expect that higher anonymity provokes a higher degree of selfishness, reflected by imposing longer waiting times on responders (hypothesis 3). Finally, we conjecture that higher opportunity costs result in more selfish offers. To test this, we have measured the outside temperature during the experiment, assuming that warm weather conditions would make the subjects more impatient to go out and enjoy the weather, driving proposers to allocate more waiting time to the responders.

## 2 Experimental design

Eighty-four subjects were recruited from the subject pool of the Department of Sociology at the Ludwig-Maximilian University of Munich (Germany). Exactly half of the subjects were male, they came from a wide area of academic disciplines<sup>1</sup> and their age ranged from 19 to 32 years. The experiments were conducted between the end of March and mid April 2009 during the semester break. The subjects received a fixed show-up fee of 15 Euro.

When a subject arrived, she had to draw a lot that determined her seat number. After all subjects had arrived, the experimental instructions were distributed and the subjects had to wait for ten minutes. This waiting time prior to the experiment was implemented to make the subjects aware of how annoying it may be to wait for a long time before they could collect the show-up fee.

The basic design of the ultimatum game over waiting time was executed as follows: First, the subjects were randomly allocated to the roles of the proposer and the responder. Proposers received a 30 centimeter long strip of paper, which represented the 60 minutes waiting time (half a centimeter corresponding to one minute). The proposer had to mark with a pen a cross on the paper strip and cut it at this mark in order to divide the waiting between herself and the responder. The proposer kept one part of the strip and the receiver was given the remainder of the strip. This decision meant that the proposer was willing to wait according to the length of her strip and the responder was proposed to wait according to the length of the strip forwarded to her. The responder could decide whether to accept the proposed division of waiting time. The agreement

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<sup>1</sup> Students of economics were only invited if they were in their first term.

was communicated with an “ok” statement on a piece of paper. Disagreement was communicated with a “not ok” statement. In case of rejection, both the proposer and the responder had to wait for the full 60 minutes until they were given the show-up fee. For the completion of their waiting time, both the proposer and the responder had to move to an isolated place which was hidden by separate visual covers. The pens were collected and the subjects were not allowed to take any private belongings with them so that they could not do anything except waiting. All waiting places were equipped with a clock so that subjects knew when their waiting time was up. After completion of the waiting time, the subjects could leave their place and show the experimenter their strip of paper to confirm that they had waited the right period of time. Finally, subjects had to complete a questionnaire before they were given their show-up fee and released from the study.

The experiment consisted of three treatments: In the *baseline treatment*, both proposers and responders were located in the same room and sat beside each other while deciding. Further, the acceptance decision of the responder was communicated with a piece of paper which was personally delivered by the proposer to the responder. After completion of the waiting time, proposers and responders personally handed the strips of paper over to the experimenter. Thus, this scenario did not implement any anonymity between the subjects nor between subjects and experimenter.

In the *anonymous I treatment*, proposers and responders were invited to two different rooms on different floors of the building. Therefore, the subjects were never able to see each other and could not see with whom they were matched with. There was a messenger (an assistant of the experimenter) who brought the proposers’ decisions in form of the paper strips to the responders. The responders wrote their decisions on a piece of paper and kept a carbon copy of this decision. The messenger returned the responders’ decisions to the proposers. The copies allowed both subjects to demonstrate the experimenter the completion of the demanded waiting time. Thus, this scenario implemented perfect anonymity between proposer and responder because they did not know with whom they were matched with. However, there was no anonymity between the subjects and the experiment staff. The subjects personally gave the paper strips to the experimenter in exchange of their money.

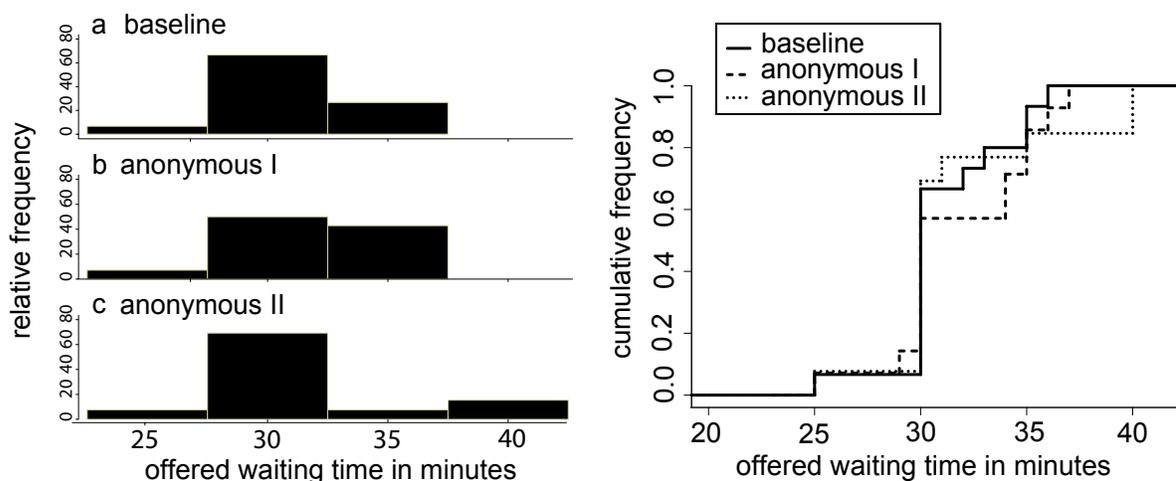
In the *anonymous II treatment*, the anonymous conditions of the anonymous I treatment were followed, namely proposers and responders were allocated to different rooms and the responders communicated their decisions with messages being delivered by an

assistant of the experimenter. In order to guarantee double-blind anonymity (Hoffman et al, 1994), however, the proposer put her paper strip in an envelope marked with a capital “B”. The experimenter put this envelope into a second envelope that was labeled with the seat number of the subject. The double envelopes were delivered by a messenger. In the other room, the experimenter distributed the envelopes to the responders according to the seat numbers. Each responder wrote her decision on a piece of paper and kept a carbon copy of this paper. The responder put the original into an envelope marked with a capital “A” and closed it. This envelope was put in a second envelope that was labeled with the seat number and returned to the proposer by the messenger. Moreover, the receipt of money also followed an anonymous procedure. The experimenter was sitting in an isolated box that completely excluded mutual sight, and verbal communication was not needed because there was a small slit in the visual cover. The subjects had to slide their paper strip together with the responder’s decision through this slit. The experimenter checked whether the right amount of waiting time was completed and entered a running number on the paper strip and on the questionnaire, which they handed out to the subject. After its return, the experimenter delivered the show-up fee to the respective subject. It was common knowledge that the experimenter could not link the proposals and the acceptance decisions with the individual subjects. Furthermore, there was full anonymity among proposers and responders. Each subject played one treatment once and only once.

### 3 Results

Our findings are surprising in three ways. First, our results confirm earlier studies on ultimatum game bargaining over money, in which fair divisions are typical. Second, anonymity does not affect proposers’ and responders’ decisions. Third, there are some hyper-fair offers, which allowed the responder to wait for less than half of the waiting time.

The above described results are demonstrated by the frequency distributions displayed in FIGURE 1. In all conditions, the *modal* offer is half of the waiting time (30 minutes). Our results suggest that anonymity does not have a great effect on fairness considerations. Interestingly, in every condition is one hyper-fair proposer who offers to wait for 35 minutes and allows the responder to leave after 25 minutes.



**Figure 1.** The distribution of offered waiting times. The offers refer to the number of minutes which the proposer requests from the responder to wait. The joint waiting time consists of 60 minutes in case of acceptance so that the proposer’s waiting time corresponds with 60 minutes minus the offer. The left panel displays histograms of the distributions of offers in the (a) baseline, (b) anonymous I and (c) anonymous II conditions. The right panel illustrates the distribution of offers in more detail with the respective cumulative frequency distributions for the three conditions. The most frequent offer is 30 minutes, there are no strongly unequal offers with a 40-20 division as the most uneven offer and the degree of anonymity between subjects and experimenter does not strongly affect the offers.

The above described results are confirmed by a linear regression model reported in TABLE 1. The *mean* offer is about 30 minutes. Compared to the baseline condition, proposers offer slightly more time in the anonymous I and slightly less time in the anonymous II condition, as can be seen from the effects of the dummy variables “anonymous I” and “anonymous II”. On average, however, this effect amounts to less than ten seconds difference in offered waiting times, which is statistically not significant.

Further, the opportunity costs in terms of the outside temperature does not have any significant effects. This variable is metric, and varies considerably over the experimental sessions between 4.5 and 20.9 degrees Celsius. This variable is transformed such that the lowest value of 4.5 corresponds to zero, which gives the regression intercept a clear meaning.

Taking all experimental scenarios together, only one offer was rejected. In this case, the responder was expected to wait for 40 minutes, while the proposer wanted to leave after 20 minutes. This was the most uneven offer in the whole experiment and happened in the anonymous II condition. In fact, it is astonishing that the offers were not more unbalanced and the behavior was other-regarding even in the anonymous II condition.

**Table 1.** Linear regression model of proposers' offers

	offer in minutes
intercept	30.4*** (33.0)
anonymous I (anonymity among subjects)	0.057 (0.053)
anonymous II (anonymity among subjects and experimenter)	-0.85 (-0.95)
oppportunity costs (outside temperature, transformed)	0.14 (1.68)
N (number of proposers)	42
r square	0.047

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

N = 84 subjects (42 proposers), robust standard errors with 6 clusters for experimental sessions used.

## 4 Discussion

In contrast to classical ultimatum game setups, we studied the behavior of subjects in an ultimatum game with real losses. In our experiments, the subjects had to impose waiting times on others. This novel design allowed to study more realistic bargaining decisions than when “windfall gains” have to be shared. Nevertheless, the modal offer was half of the waiting time independently of the level of anonymity in the different experimental treatments, and only one offer was rejected.

Our experimental results indicate firstly that anonymity plays a smaller role in the ultimatum game than expected. Apparently, individuals still perceive the game as a strategic situation in which they are afraid that unfair offers will be punished by a rejection of the offer, leading to rather balanced waiting times among proposers and responders. Secondly, it does not matter whether subjects share waiting time or windfall money. Therefore, implications of prospect theory, according to which individuals would be more risk-seeking in situations with losses than in situations with gains, cannot be easily transferred to strategic decision making (for further discussion of this point see [Berejikian, 1992](#); [Walder, 2000](#)). Thus, the “social” aspect of the situation seems to weight stronger than the individual preference. While one would expect less cooperation in situations of losses ([Raub and Snijders, 1997](#)), this was not confirmed by the average waiting time offers. In each experimental condition, there was even one proposer, who

offered to wait longer than half of the waiting time.

Within the framework of our experiments, we have explored new anonymity treatments and replaced bargaining over gains by bargaining over losses. Our exploration of novel procedures for generating anonymity among subjects and experimenter open interesting perspectives for the development of standards in experimental economics. Furthermore, these techniques can be easily transferred to other experiments. Besides imposing annoying waiting times on people, it would, of course, also be conceivable to demand physical efforts from the experimental subjects (cf. [Ingham et al, 1974](#); [Gneezy and Rustichini, 2004](#)).

## **Authors' contributions**

RB introduced the idea of studying ultimatum game experiments with time. All four authors developed the experimental design together. SP conducted the experiment, performed preliminary data analyses and wrote a German report. HR performed the final data analysis and wrote the first draft of the manuscript. RB, SP and DH edited the draft and contributed additional paragraphs.

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